

We claim:-

1. A process for the preparation of an aqueous polymer dispersion by free radical aqueous emulsion polymerization of at least one ethylenically unsaturated compound (monomer) in the presence of at least one dispersant, wherein
 - 5 a) in a reaction vessel at a temperature which is less than or equal to the starting reaction temperature T_S ,
 - a₁) at least one portion of demineralized water,
 - a₂) at least one portion of at least one oil-soluble free radical initiator,
 - a₃) at least one portion of at least one dispersant,
 - a₄) if appropriate, a portion of the at least one monomer and
 - a₅) if appropriate, a portion of at least one water-soluble free radical initiator are initially taken, thereafter
 - 10 b) the reaction mixture obtained is, if appropriate, heated to the starting reaction temperature T_S , thereafter
 - c) the following are metered into the reaction mixture:
 - c₁) if appropriate, the remaining amount of demineralized water,
 - c₂) if appropriate, the remaining amount of the at least one oil-soluble free radical initiator,
 - c₃) if appropriate, the remaining amount of the at least one dispersant,
 - c₄) the total amount or, if appropriate, the remaining amount of the at least one monomer and
 - c₅) the main amount of the at least one water-soluble free radical initiator, and
 - 15 c) the reaction mixture is heated to an end reaction temperature T_E during the metering of the at least one monomer.
2. The process according to claim 1, wherein the at least one water-soluble free radical initiator initiates a free radical polymerization reaction of the at least one monomer at the starting reaction temperature T_S .
- 30 3. The process according to either of claims 1 and 2, wherein the oil-soluble free radical initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_S and a half-life of ≤ 5 hours at the end reaction temperature T_E .
- 35 4. The process according to any of claims 1 to 3, wherein $T_E \geq T_S + 10^\circ\text{C}$.
5. The process according to any of claims 1 to 4, wherein T_S is from ≥ 30 to $\leq 120^\circ\text{C}$ and T_E is from ≥ 80 to $\leq 200^\circ\text{C}$.

6. The process according to any of claims 1 to 5, wherein the amount of water-soluble and oil-soluble free radical initiator is in each case from 0.01 to 5% by weight, based on the total amount of monomer.
- 5 7. The process according to any of claims 1 to 6, wherein the pressure during the polymerization is chosen so that the reaction mixture does not boil at any time.
- 10 8. The process according to any of claims 1 to 7, wherein the water-soluble free radical initiator used is a mono- or di-alkali metal or ammonium salt of peroxodisulfuric acid.
- 15 9. The process according to any of claims 1 to 8, wherein the oil-soluble free radical initiator used is a compound selected from the group consisting of tert-butyl peroxy-2-ethylhexanoate (Trigonox® 21), tert-amyl peroxy-2-ethylhexanoate, tert-butyl peroxybenzoate (Trigonox® C), tert-amyl peroxybenzoate, tert-butyl peroxyacetate, tert-butyl peroxy-3,5,5-trimethylhexanoate (Trigonox® 42 S), tert-butyl peroxyisobutanoate, tert-butyl peroxydiethylacetate, tert-butyl peroxypropionate, tert-butyl peroxyisopropylcarbonate, (Trigonox® BPIC) and tert-butyl peroxy-2-ethylhexylcarbonate (Trigonox® 117).
- 20 10. The process according to any of claims 1 to 9, wherein the reaction mixture is kept at the end reaction temperature T_E for at least a further 30 minutes after the end of the monomer metering.
- 25 11. The process according to any of claims 1 to 10, wherein the reaction mixture is stripped with inert gas and/or steam after the end of the monomer metering.
12. An aqueous polymer dispersion obtainable by the process according to any of claims 1 to 11.
- 30 13. The use of the aqueous polymer dispersion according to claim 12 as a binder in adhesives, sealing compounds, plastics renders, paper coating slips and surface coating materials and for modifying mineral binders.
- 35 14. A polymer powder obtainable from the aqueous polymer dispersion according to claim 12.